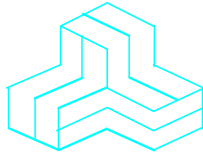


# ENGINEERING TEST REPORT



**Onsight Rugged Smart Camera  
Model: 5000HD  
FCC ID: T78-5000HD**

*Applicant:*

**Librestream Technologies Inc.**  
Suite 110, 895 Waverley St.  
Winnipeg, MB  
Canada R3T 5P4

***In Accordance With***

**Federal Communications Commission (FCC)  
Part 15, Subpart C  
Unlicensed Low Power Transmitter Operating in the Band 13.110-14.010 MHz**

**UltraTech's File No.: 17LIBT073\_FCC15C225**

This Test report is Issued under the Authority of  
Tri M. Luu  
Vice President of Engineering  
UltraTech Group of Labs

Date: March 6, 2017

Report Prepared by: Dan Huynh

Tested by: Wei Wu

Issued Date: March 6, 2017

Test Date(s): January 24-27, 2017  
February 2 & March 3, 2017

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by any agency of the US Government.*
- *This test report shall not be reproduced, except in full, without a written approval from UltraTech*

## UltraTech

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91038



1309



46390-2049



AT-1945



SL2-IN-E-1119R



Korea  
KCC-RRR  
CA2049

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## EXHIBIT 1. INTRODUCTION

### 1.1. SCOPE

<b>Reference:</b>	FCC Part 15, Subpart C, Sec. 15.225 - Operation within the band 13.110 – 14.010 MHz.
<b>Title:</b>	Code of Federal Regulations (CFR), Title 47 Telecommunication, Part 15, Subpart C - Intentional Radiators
<b>Purpose of Test:</b>	Equipment Certification for FCC Part 15C.
<b>Test Procedures:</b>	ANSI C63.4 and ANSI C63.10
<b>Environmental Classification:</b>	<ul style="list-style-type: none"><li>• Residential</li><li>• Commercial, industrial or business environment</li></ul>

### 1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

### 1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC 47 CFR 15	2017	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
CISPR 22 & EN 55022	2008-09, Edition 6.0 2006	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement

**EXHIBIT 2. PERFORMANCE ASSESSMENT**

**2.1. CLIENT INFORMATION**

<b>Applicant</b>	
<b>Name:</b>	Librestream Technologies Inc.
<b>Address:</b>	Suite 110, 895 Waverley St. Winnipeg MB Canada R3T 5P4
<b>Contact Person:</b>	Gilles Aminot Phone #: 204-487-0612 ext 218 Fax #: 204-487-0914 Email Address: <a href="mailto:gilles.aminot@librestream.com">gilles.aminot@librestream.com</a>

<b>Manufacturer</b>	
<b>Name:</b>	Librestream Technologies Inc.
<b>Address:</b>	Suite 110, 895 Waverley St. Winnipeg MB Canada R3T 5P4
<b>Contact Person:</b>	Gilles Aminot Phone #: 204-487-0612 ext 218 Fax #: 204-487-0914 Email Address: <a href="mailto:gilles.aminot@librestream.com">gilles.aminot@librestream.com</a>

**2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION**

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

<b>Brand Name:</b>	Librestream Technologies Inc.
<b>Product Name:</b>	Onsite Rugged Smart Camera
<b>Model Name or Number:</b>	5000HD
<b>Serial Number:</b>	Test sample
<b>Type of Equipment:</b>	Part 15 Low Power Communication Device Transmitter
<b>Input Power Supply Type:</b>	External DC 5 VDC Battery, 3.2 - 4.2 VDC, 3.7 VDC nominal
<b>Primary User Functions of EUT:</b>	The Onsite mobile collaboration devices are used to communicate with an Onsite Expert user (or multiple Onsite Expert users) over an Onsite System network. The Onsite device can fully collaborate from a remote site.

### 2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Intended Operating Environment:	<ul style="list-style-type: none"><li>Residential</li><li>Commercial, industrial or business environment</li></ul>
Power Supply Requirement:	Battery 3.2 - 4.2 VDC, 3.7 VDC nominal
Field Strength:	45.55 dB $\mu$ V/m at 10 m
Operating Frequency Range:	13.56 MHz
RF Output Impedance:	50 $\Omega$
20 dB Bandwidth:	918.27 kHz
Modulation Type:	ASK
Oscillator Frequencies:	24.0000MHz, 28.63636MHz, 32.768KHz, 27.12MHz
Antenna Connector Type:	Integral

### 2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	USB 2.0 OTG Port	1	USB	Shielded
2	USB 2.0 Host Port	1	USB	Shielded
3	HDMI	1	HDMI	Shielded
4	DC IN	1	Power Jack	Non-shielded
5	Headphone	1	Headphone Jack	Non-shielded

**2.5. ANCILLARY EQUIPMENT**

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

<b>Ancillary Equipment # 1</b>	
Description:	ITE Power Supply AC Adapter
Brand name:	CUI INC
Model Name or Number:	SMI18-5
Connected to EUT's Port:	Power Port

<b>Ancillary Equipment # 2</b>	
Description:	Headphone
Brand name:	Eartec
Model Name or Number:	N/A
Connected to EUT's Port:	Earphone

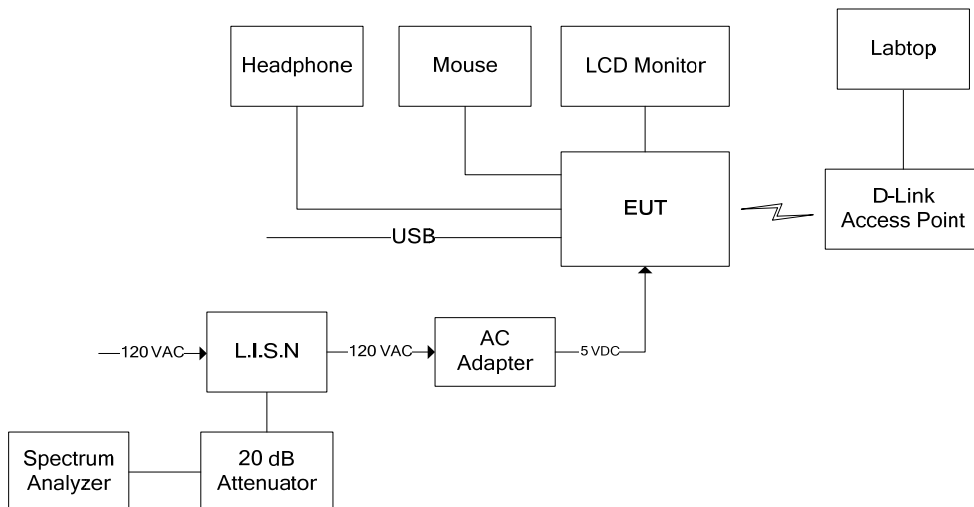
<b>Ancillary Equipment # 3</b>	
Description:	Mouse
Brand name:	Dell
Model Name or Number:	P/N: 04P608
Connected to EUT's Port:	USB

<b>Ancillary Equipment # 4</b>	
Description:	LCD Monitor
Brand name:	Dell
Model Name or Number:	2408WFPB
Connected to EUT's Port:	HDMI

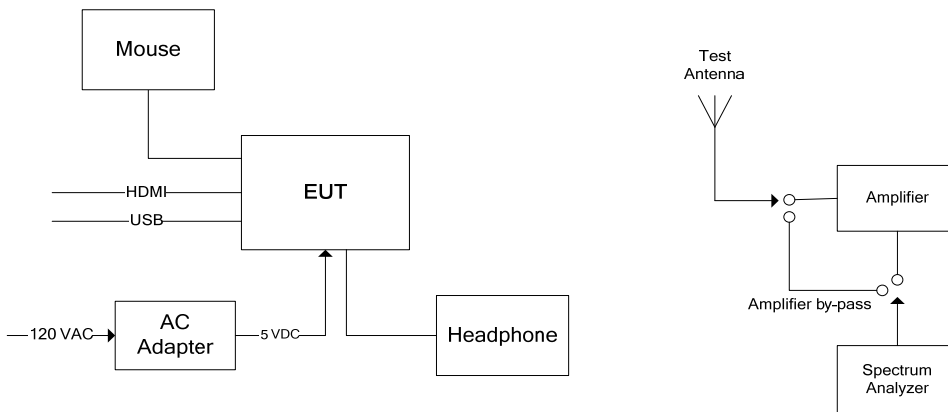
<b>Ancillary Equipment # 5</b>	
Description:	USB cable connected to load
Brand name:	Generic
Model Name or Number:	N/A
Connected to EUT's Port:	USB

2.6. GENERAL TEST SETUP

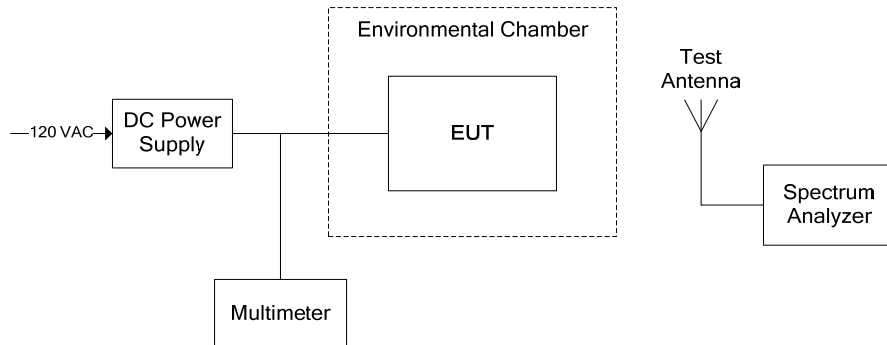
Power Line Conducted Emission



Transmitter Radiated Emission



### Frequency Stability





**EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS**

**3.1.1. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS**

**3.2. CLIMATE TEST CONDITIONS**

The climate conditions of the test environment are as follows:

Temperature:	21 to 23 °C
Humidity:	45 to 58%
Pressure:	102 kPa
Power input source:	3.2 - 4.2 VDC

**3.3. OPEPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS**

<b>Operating Modes:</b>	The EUT was configured for continuous transmission for the duration of testing.
<b>Special Test Software:</b>	N/A
<b>Special Hardware Used:</b>	N/A
<b>Transmitter Test Antenna:</b>	The EUT was tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment.

<b>Transmitter Test Signals:</b>	
<b>Frequency Band(s):</b>	13.56 MHz
<b>Test Frequency(ies):</b>	13.56 MHz
<b>Transmitter Wanted Output Test Signals:</b>	
▪ RF Power Output (measured maximum output power):	45.55 dBµV/m at 10 m
▪ Normal Test Modulation:	ASK
▪ Modulating signal source:	Internal

## EXHIBIT 4. SUMMARY OF TEST RESULTS

### 4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).
- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2017-04-02.

### 4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Regulations	Test Requirements	Compliance (Yes/No)
15.203 & 15.204	The transmitter shall use a transmitting antenna that is an integral part of the device	Yes*
15.207(a)	Power Line Conducted Emissions	Yes
15.215(c)	Emission Bandwidth	Yes
15.225(a) – (d)	Field Strength of Emissions Inside and Outside the Permitted Band 13.110 - 14.010 MHz	Yes
15.225(e)	Frequency Stability	Yes

\* The EUT complies with the requirement; it employs integral antenna.

### 4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

**EXHIBIT 5. TEST DATA**

**5.1. POWER LINE CONDUCTED EMISSIONS [§15.207(a)]**

**5.1.1. Limit(s)**

The equipment shall meet the limits of the following table:

Frequency of emission (MHz)	Conducted Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15–0.5 .....	66 to 56* .....	56 to 46*
0.5–5 .....	56 .....	46
5–30 .....	60 .....	50

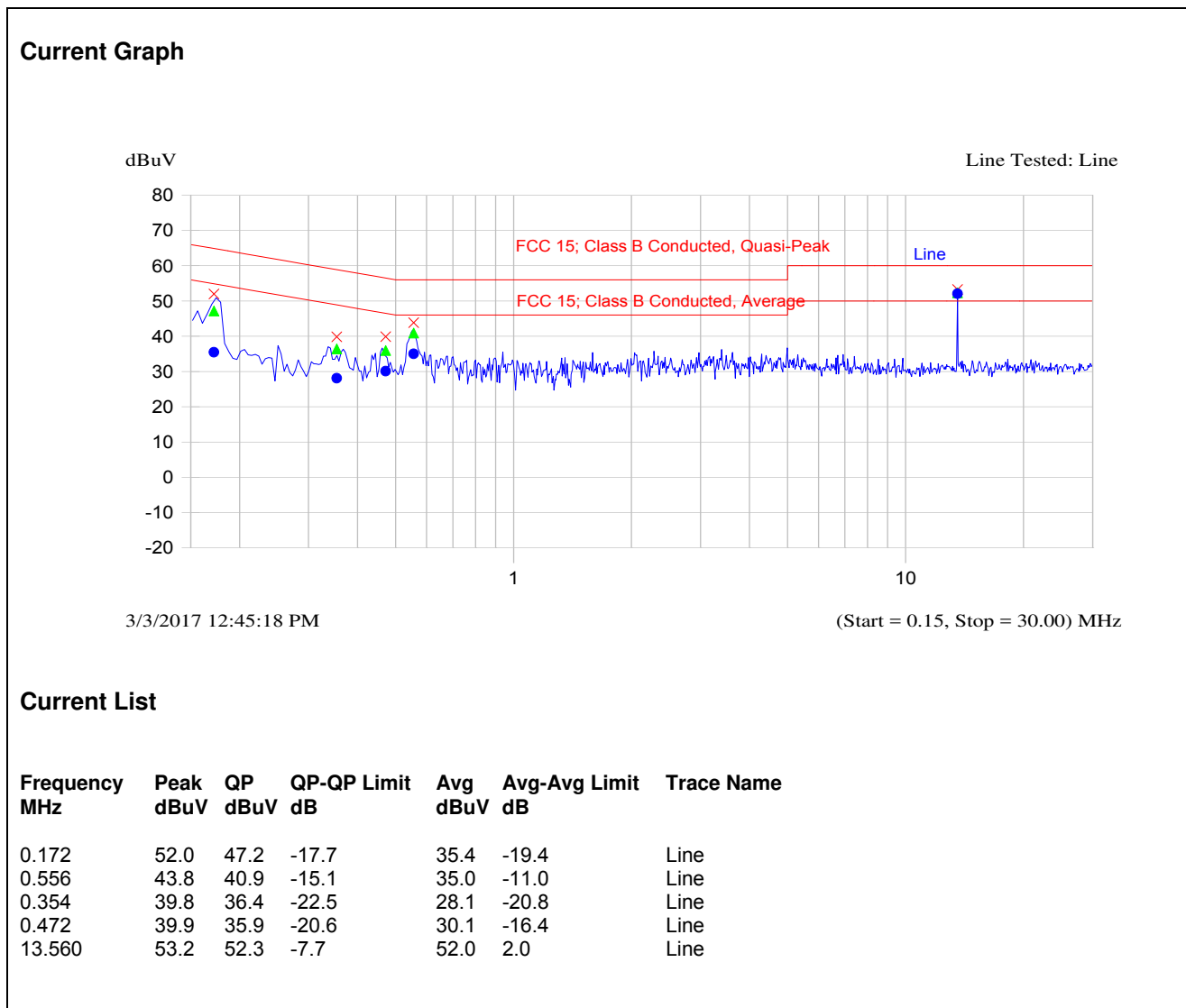
\*Decreases linearly with the logarithm of the frequency

**5.1.2. Method of Measurements**

ANSI C63.4-2014

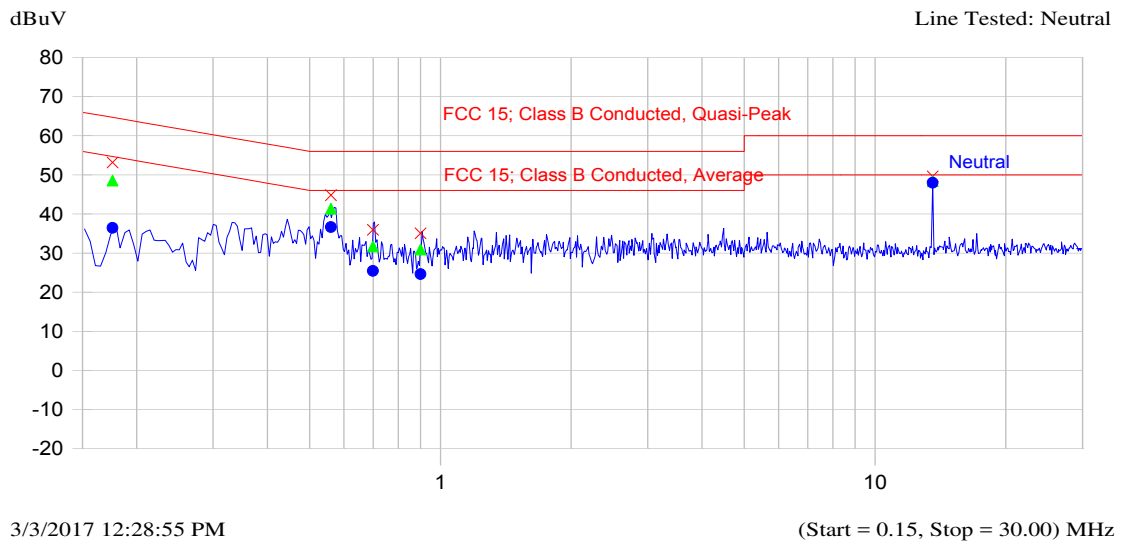
5.1.3. Test Data

**Plot 5.1.3.1.** Power Line Conducted Emissions  
 Test Configuration 1: EUT without shielding  
 Line Tested: Line



**Plot 5.1.3.2. Power Line Conducted Emissions**  
 Test Configuration 1: EUT without shielding  
 Line Tested: Neutral

**Current Graph**



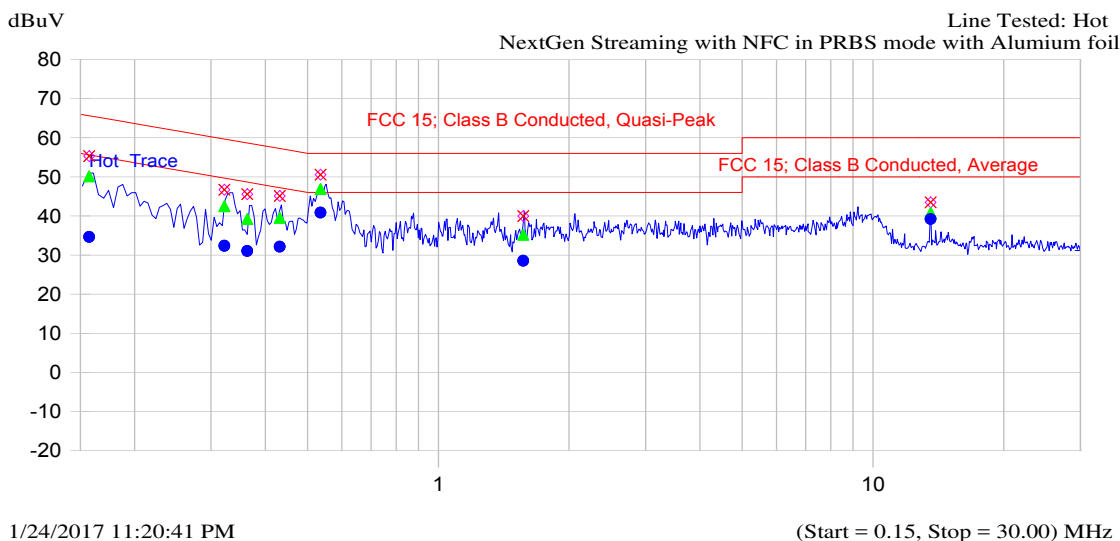
**Current List**

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.176	53.2	48.5	-16.1	36.4	-18.2	Neutral
0.560	44.8	41.4	-14.6	36.6	-9.4	Neutral
0.700	35.9	31.7	-24.3	25.4	-20.6	Neutral
0.900	35.0	30.9	-25.1	24.6	-21.4	Neutral
13.561	49.6	48.4	-11.6	48.0	-2.0	Neutral

**Plot 5.1.3.3. Power Line Conducted Emissions**

Test Configuration 2: EUT with shielding from aluminum foil was used since testing with a dummy load was not possible  
 Line Voltage: 120 VAC; Line Tested: Hot

**Current Graph**



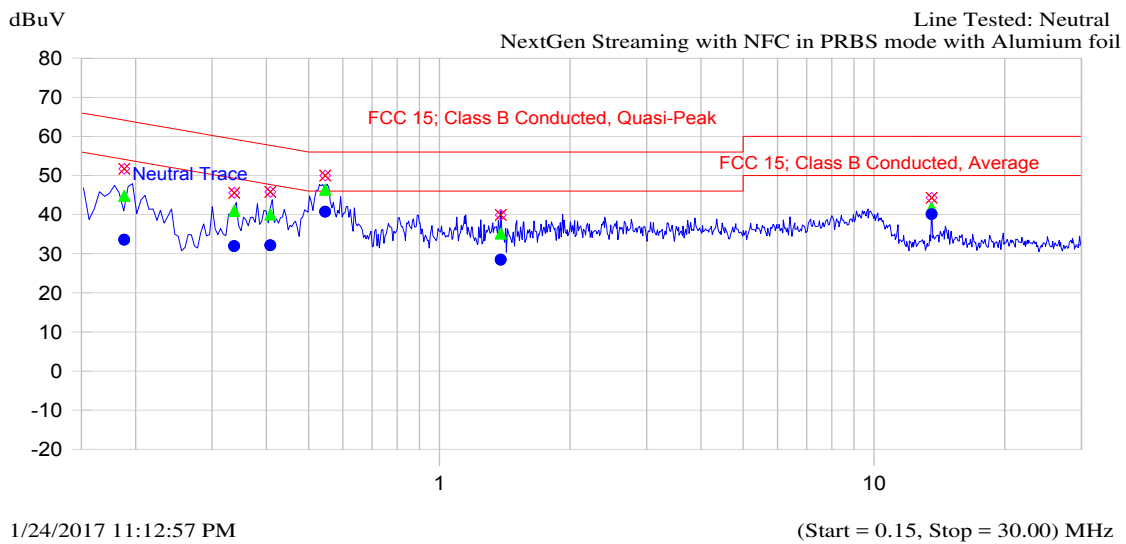
**Current List**

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.157	55.3	50.1	-15.5	34.7	-21.0	Hot Trace
0.322	46.7	42.5	-17.1	32.4	-17.3	Hot Trace
0.363	45.6	39.2	-19.4	31.0	-17.6	Hot Trace
0.432	45.1	39.5	-17.7	32.1	-15.1	Hot Trace
0.536	50.5	46.9	-9.1	40.8	-5.2	Hot Trace
1.568	40.0	35.2	-20.8	28.5	-17.5	Hot Trace
13.562	43.5	40.9	-19.1	39.2	-10.8	Hot Trace

**Plot 5.1.3.4. Power Line Conducted Emissions**

Test Configuration 2: EUT with shielding from aluminum foil was used since testing with a dummy load was not possible  
 Line Tested: Neutral

**Current Graph**



**Current List**

Frequency MHz	Peak dBuV	QP dBuV	QP-QP Limit dB	Avg dBuV	Avg-Avg Limit dB	Trace Name
0.188	51.7	44.8	-19.3	33.5	-20.6	Neutral Trace
0.337	45.6	40.9	-18.4	31.9	-17.3	Neutral Trace
0.408	45.8	40.0	-17.6	32.1	-15.6	Neutral Trace
0.546	50.0	46.4	-9.6	40.7	-5.3	Neutral Trace

## 5.2. EMISSION BANDWIDTH

### 5.2.1. Limit(s)

The 20 dB bandwidth of the emission shall be contained within the band 13.110–14.010 MHz.

### 5.2.2. Method of Measurements

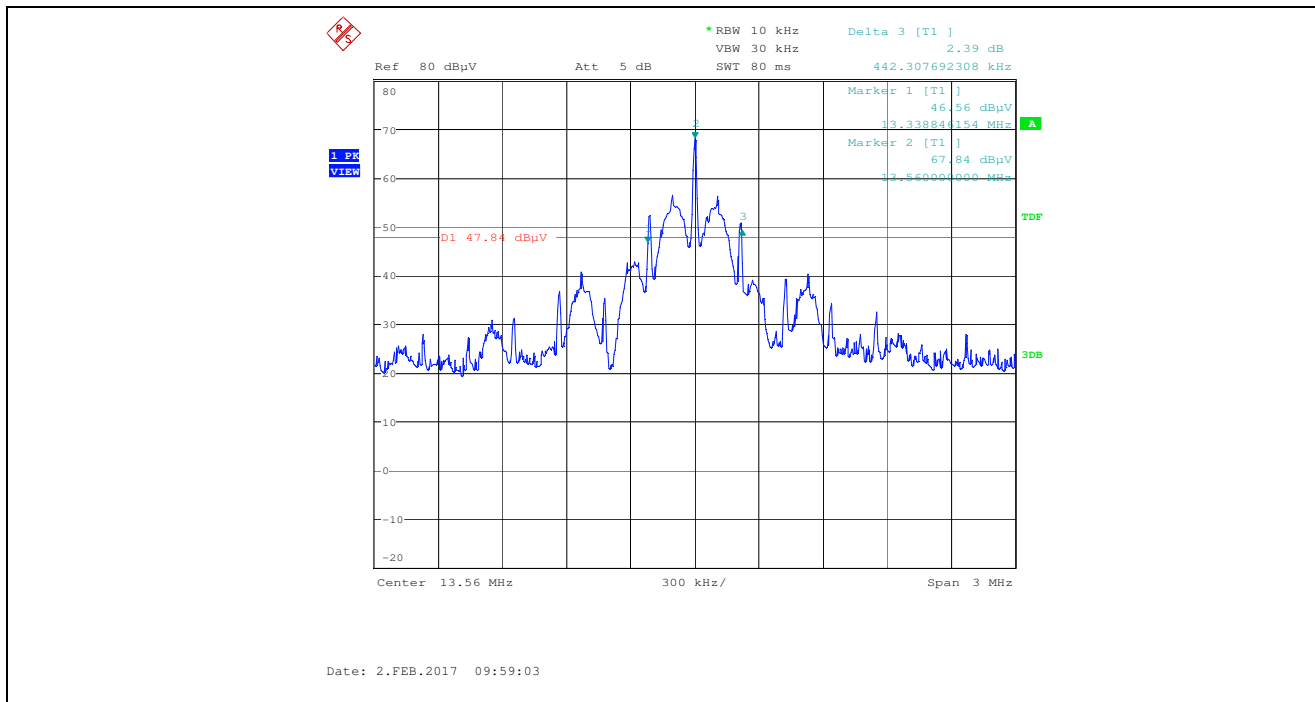
ANSI C63.4.

### 5.2.3. Test Data

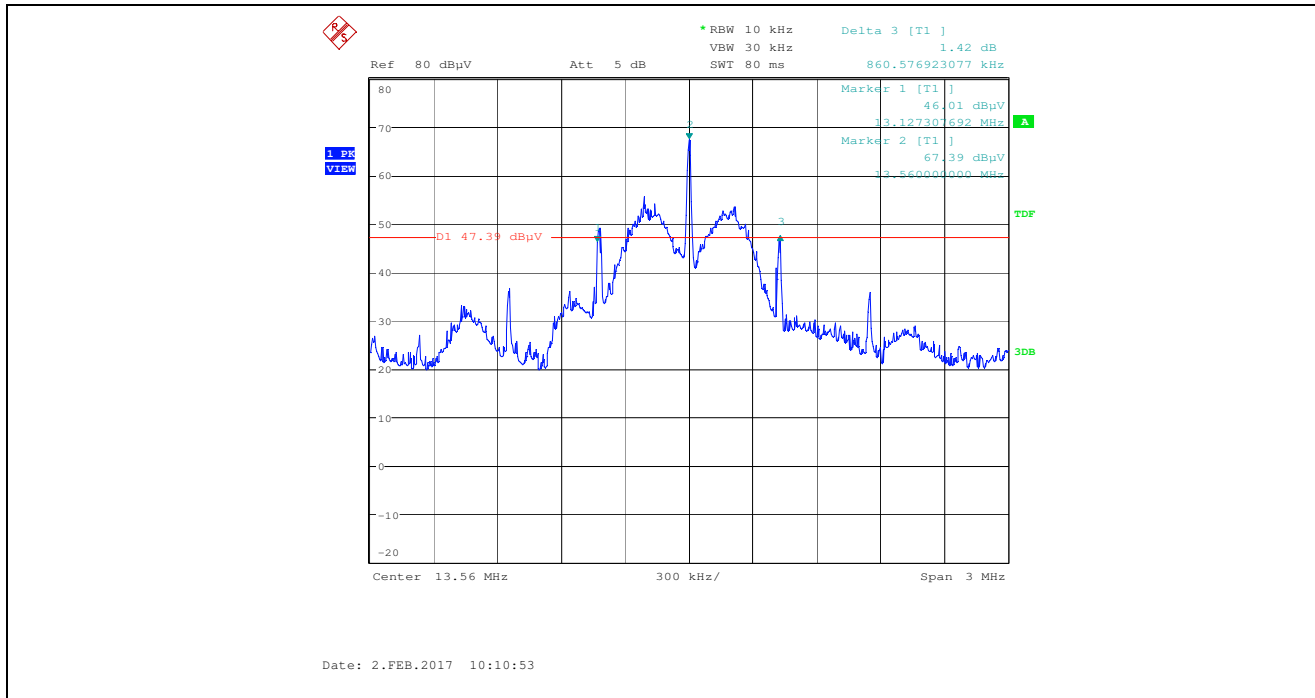
Test Frequency (MHz)	Technology	Bit Rate	20 dB Occupied Bandwidth (kHz)
13.56	A	106	442.31
		212	860.58
		424	754.81
		848	33.65
	B	106	35.26
		212	33.65
		424	33.65
		848	33.33



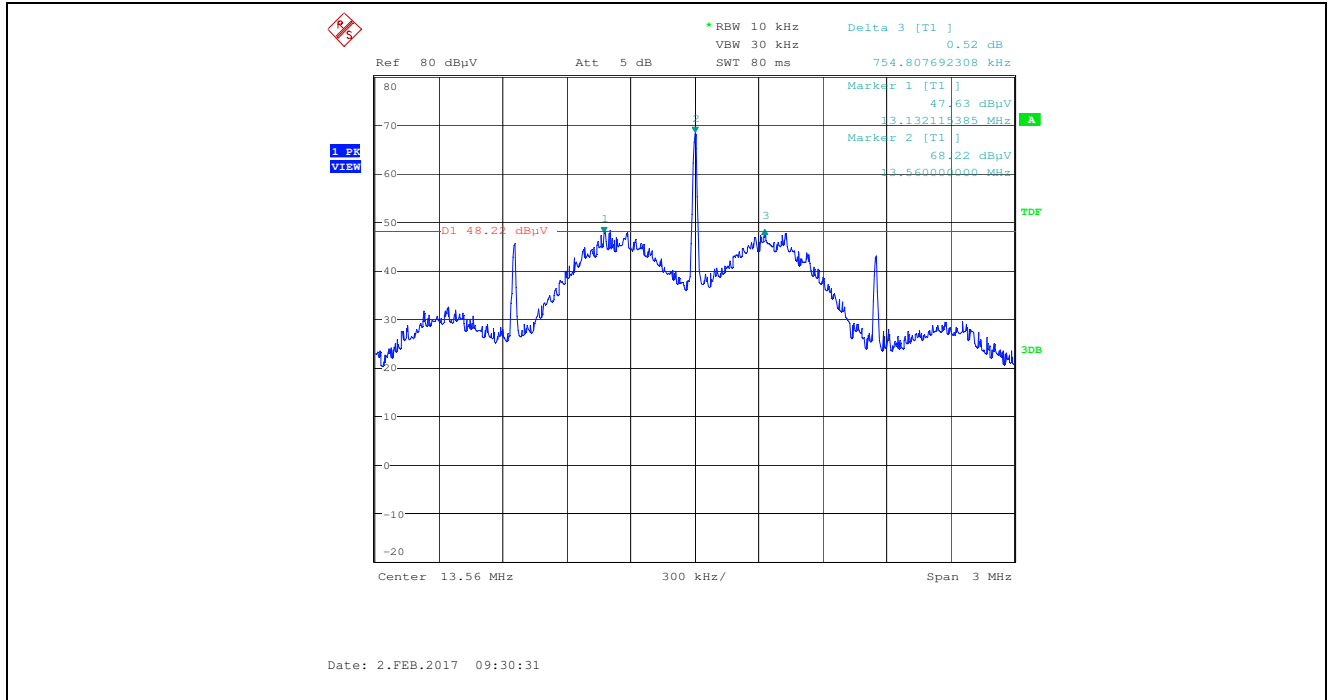
Plot 5.2.3.1. 20 dB Bandwidth, Fc: 13.56 MHz, Technology A, Bit Rate 106



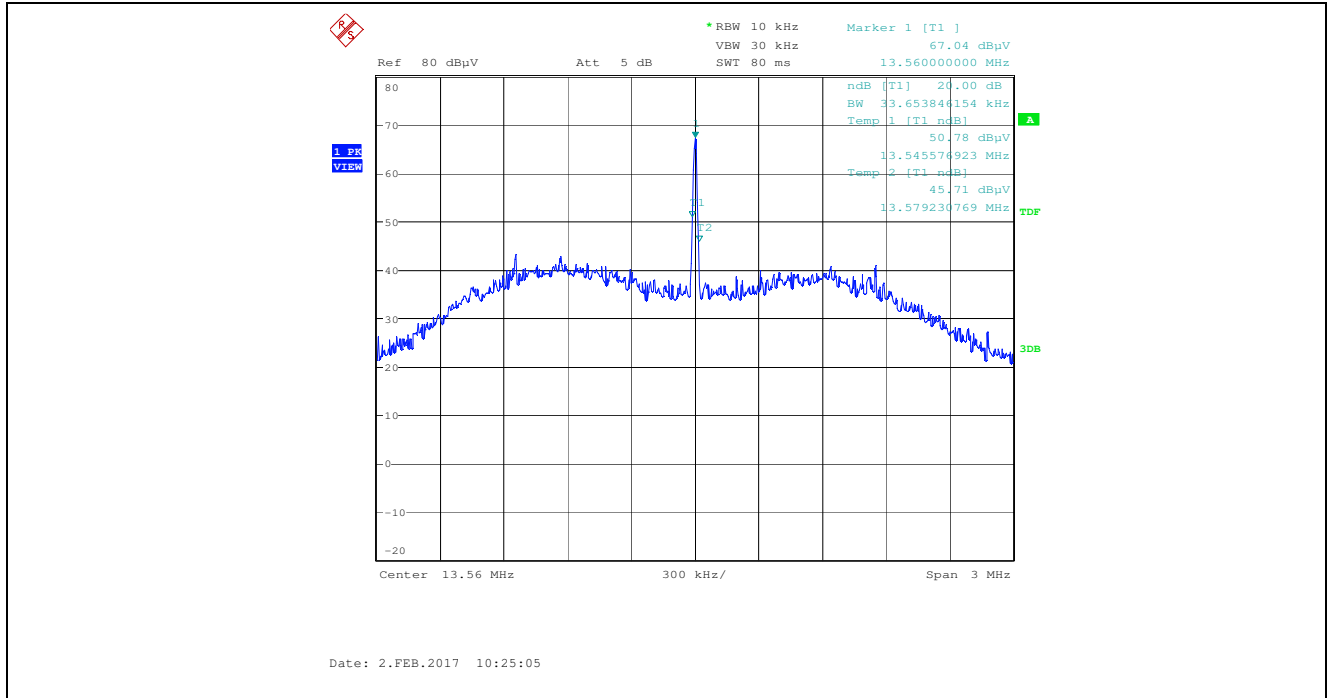
Plot 5.2.3.2. 20 dB Bandwidth, Fc: 13.56 MHz, Technology A, Bit Rate 212



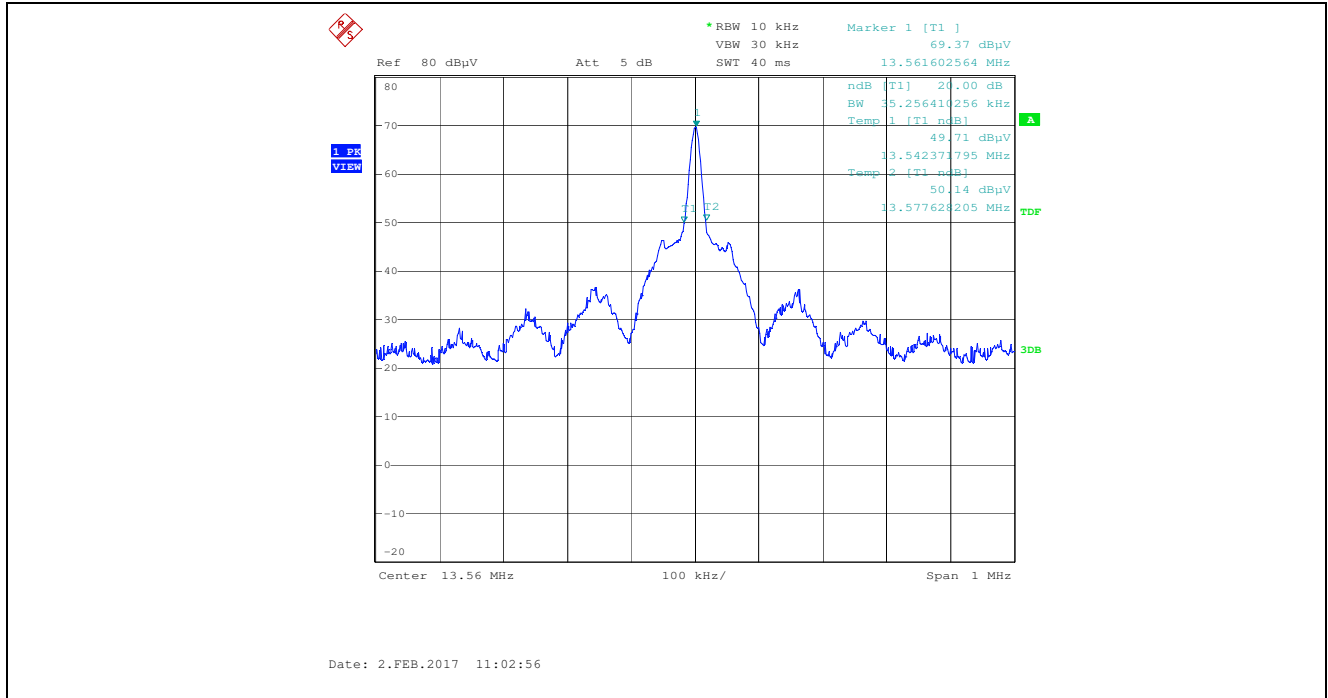
Plot 5.2.3.3. 20 dB Bandwidth, Fc: 13.56 MHz, Technology A, Bit Rate 424



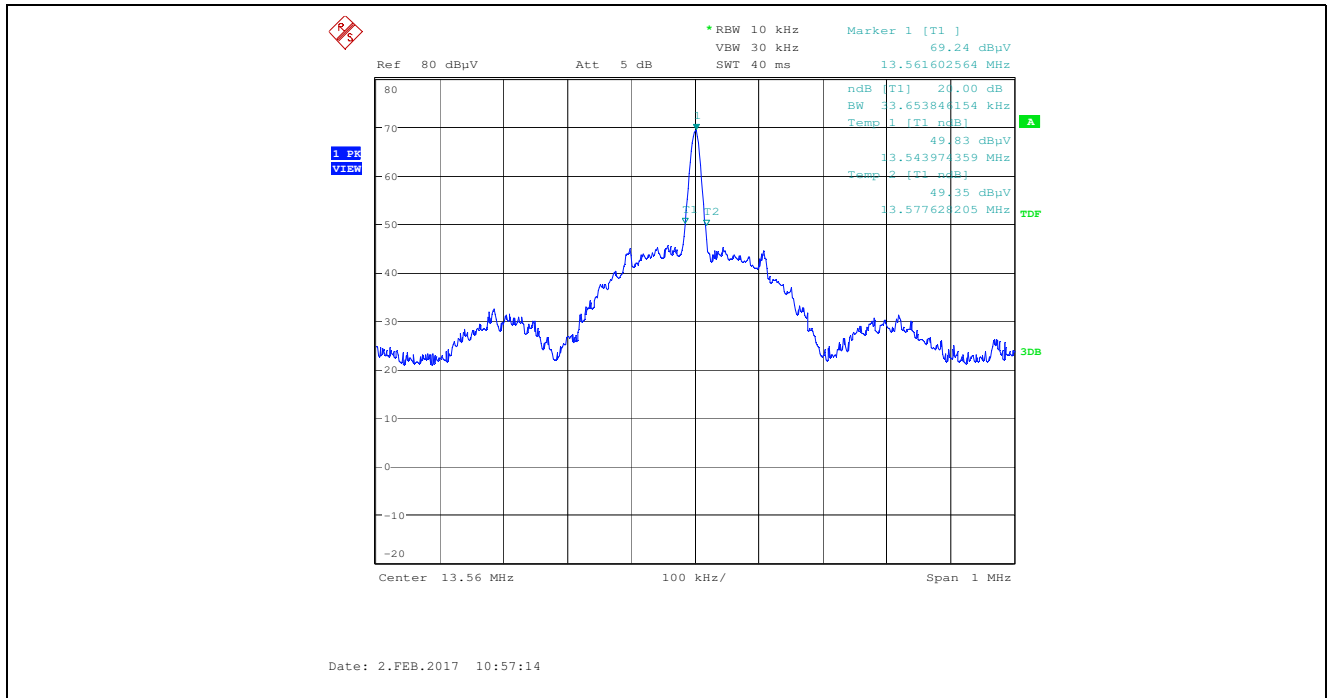
Plot 5.2.3.4. 20 dB Bandwidth, Fc: 13.56 MHz, Technology A, Bit Rate 848



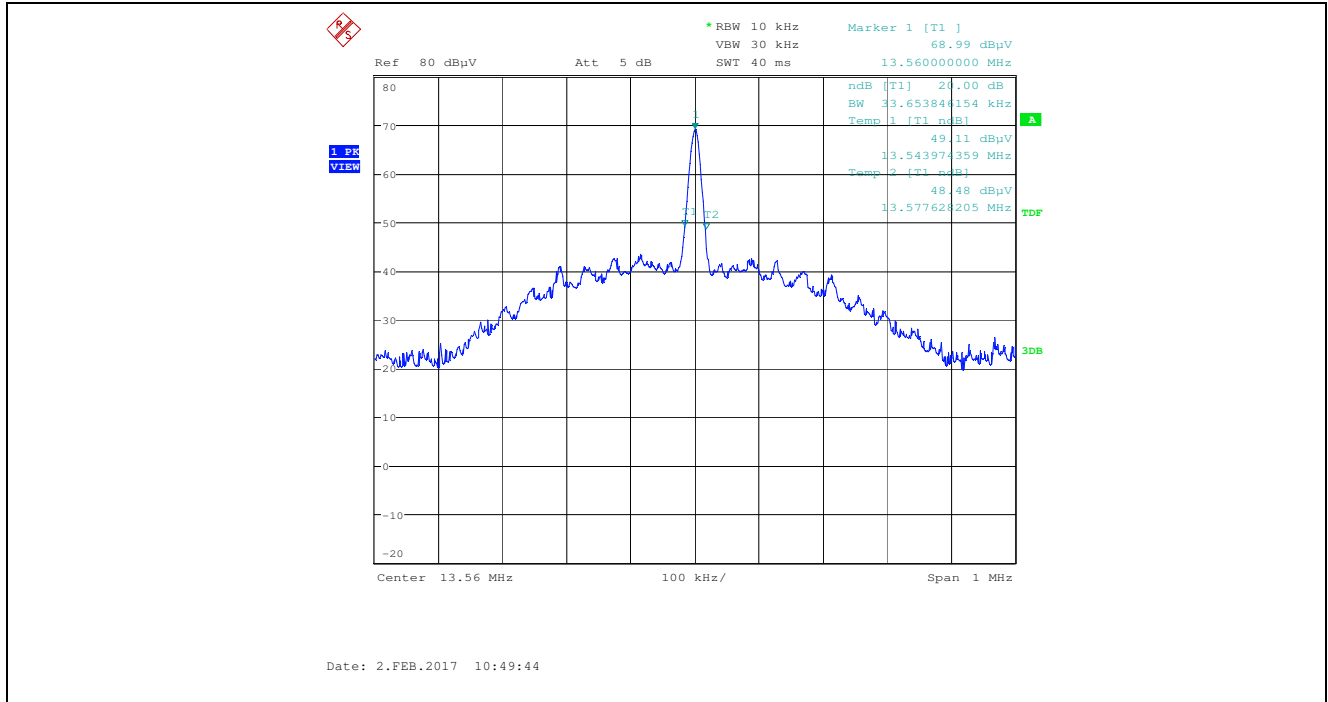
Plot 5.2.3.5. 20 dB Bandwidth, Fc: 13.56 MHz, Technology B, Bit Rate 106



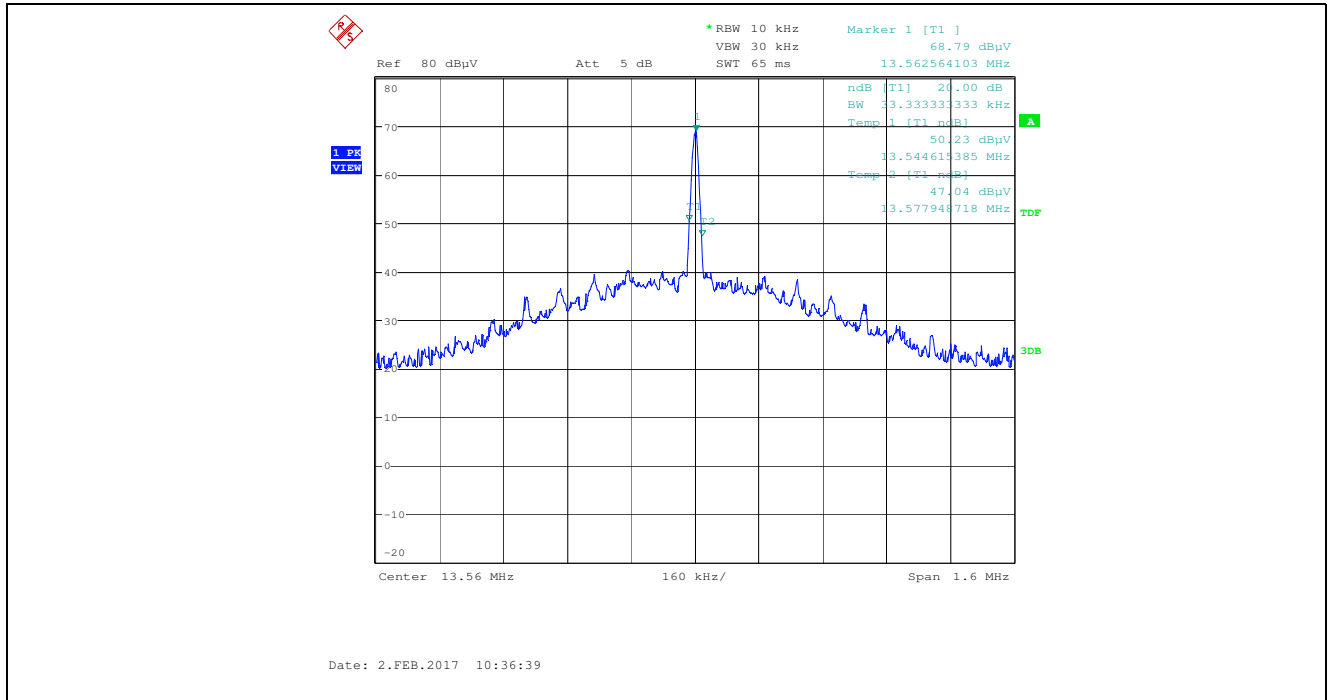
Plot 5.2.3.6. 20 dB Bandwidth, Fc: 13.56 MHz, Technology B, Bit Rate 212



Plot 5.2.3.7. 20 dB Bandwidth, Fc: 13.56 MHz, Technology B, Bit Rate 424



Plot 5.2.3.8. 20 dB Bandwidth, Fc: 13.56 MHz, Technology B, Bit Rate 848



**5.3. FIELD STRENGTH OF EMISSIONS WITHIN & OUTSIDE THE PERMITTED BAND 13.110-14.010 MHz [47 CFR 15.225 (a) to (d)]**

**5.3.1. Limits**

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

**47 CFR 15.209(a) – Radiated Emission Limits; general requirements**

Frequency (MHz)	Field Strength Limits (microvolts/m)	Distance (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

**5.3.2. Method of Measurements**

ANSI C63.10 and ANSI C63.4 for measurement methods.

**5.3.3. Test Data**

**Remarks:**

- Radiated spurious emissions measurements were performed at a measuring distance of 10 m (for frequencies below 30 MHz) and 3 m (for frequencies at or above 30 MHz), from 10 kHz – 10<sup>th</sup> harmonic of the fundamental or the range applicable to the digital device, whichever is the higher frequency range and all spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- For frequencies below 30 MHz, the results measured at 10 m distance shall be extrapolated to the specified distance using an extrapolation factor of 40 dB/decade for determining compliance.

**5.3.3.1. Field Strength of Emissions Within the Permitted Band at 10 m**

Frequency (MHz)	Measured Field Strength @ 10 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Field Strength Extrapolated Value (dBµV/m)	§ 15.225 Field Strength Limits (dBµV/m)	Margin (dB)
13.56	45.55	Peak	V	26.47	84.0	-57.5
13.56	38.95	Peak	H	19.87	84.0	-64.1

**5.3.3.2. Field Strength of Emissions Outside the Permitted Band Below 30 MHz at 10 m**

Frequency (MHz)	Measured Field Strength @ 10 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Field Strength Extrapolated Value (dBµV/m)	§ 15.209 Field Strength Limits (dBµV/m)	Margin (dB)
All spurious emissions are more than 20 dB below the specified limit.						

**5.3.3.3. Field Strength of Emissions Outside the Permitted Band at or Above 30 MHz at 3 m**

Frequency (MHz)	Measured Field Strength @ 3 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	§ 15.209 Field Strength Limits (dBµV/m)	Margin (dB)
81.36	34.30	Peak	V	40.0	-5.7
81.36	30.60	QP	H	40.0	-9.4
94.92	34.10	QP	V	43.5	-9.4
94.92	38.85	Peak	H	43.5	-4.7

**5.4. FREQUENCY STABILITY [47 CFR 15.225(e)]**

**5.4.1. Limit(s)**

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

**5.4.2. Method of Measurements**

ANSI C63.10.

**5.4.3. Test Data**

<b>Frequency Band:</b>	13.56 MHz
<b>Center Frequency:</b>	13.56 MHz
<b>Frequency Tolerance Limit:</b>	± 0.01% (±1356 Hz)
<b>Max. Frequency Tolerance Measured:</b>	+160 Hz
<b>Input Voltage Rating:</b>	3.2- 4.2 VDC, 3.7 VDC Nominal

Ambient Temperature (°C)	Frequency Drift (Hz)		
	Supply Voltage (Nominal) 3.7VDC	Supply Voltage (85 % of Nominal) 3.2 VDC	Supply Voltage (115% of Nominal) 4.2 VDC
-20	+160	--	--
-10	+160	--	--
0	+160	--	--
+10	+160	--	--
+20	0	0	0
+30	+160	--	--
+40	+160	--	--
+50	+160	--	--
+60	+160	--	--

**EXHIBIT 6. TEST EQUIPMENT LIST**

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Rhode & Schwarz	FSU	1100398	20Hz-26.5GHz	14 Sep 2017
Biconical Antenna	ETS	3110B	3379	20-200MHz	11 Sep 2017
Loop Antenna	EMCO	6502	9104-2611	10kHz-30MHz	5 Nov 2017
Preamplifier	Com-power	PA-103A	161243	10-1000MHz	4 Oct 2017
Environmental Chamber	Envirotronics	SSH32C	11994847-S-11059	-60 to 177 °C	2 Jun 2017
Spectrum Analyzer	Rhode & Schwarz	FSU	1100398	20Hz-26.5GHz	14 Sep 2017
Spectrum Analyzer	HP	8593EM	3412A00103	9kHz-26.5GHz	9 Apr 2017
LISN	EMCO	3825/2R	1165	10kHz-30MHz	11 Nov 2017
Attenuator	Pasternack	PE7010-20	7	DC-2GHz	26 Mar 2017
EMI Receiver	Rhode & Schwarz	ESU40	100037	20Hz-40GHz	8 May 2017
Biconical Antenna	EMCO	3142	9601-1005	26-2000MHz	12 May 2017
DC Power Supply	Tenma	726153	0001526	0-20 V, 0-10 A	Note 1
Multi-meter	Tenma	72-6202	02080027	Max: 1kV, 10A	20 Nov 2017
Note 1: Internal Verification/Calibration check					



**EXHIBIT 7. MEASUREMENT UNCERTAINTY**

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

**7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY**

	Line Conducted Emission Measurement Uncertainty (9 kHz – 30 MHz):	Measured	Limit
<b>u<sub>c</sub></b>	<b>Combined standard uncertainty:</b> $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.44	± 1.8
<b>U</b>	<b>Expanded uncertainty U:</b> $U = 2u_c(y)$	± 2.89	± 3.6

**7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY**

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured (dB)	Limit (dB)
<b>u<sub>c</sub></b>	<b>Combined standard uncertainty:</b> $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
<b>U</b>	<b>Expanded uncertainty U:</b> $U = 2u_c(y)$	± 4.79	± 5.2

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured (dB)	Limit (dB)
<b>u<sub>c</sub></b>	<b>Combined standard uncertainty:</b> $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
<b>U</b>	<b>Expanded uncertainty U:</b> $U = 2u_c(y)$	± 4.78	± 5.2

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured (dB)	Limit (dB)
<b>u<sub>c</sub></b>	<b>Combined standard uncertainty:</b> $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.87	Under consideration
<b>U</b>	<b>Expanded uncertainty U:</b> $U = 2u_c(y)$	± 3.75	Under consideration